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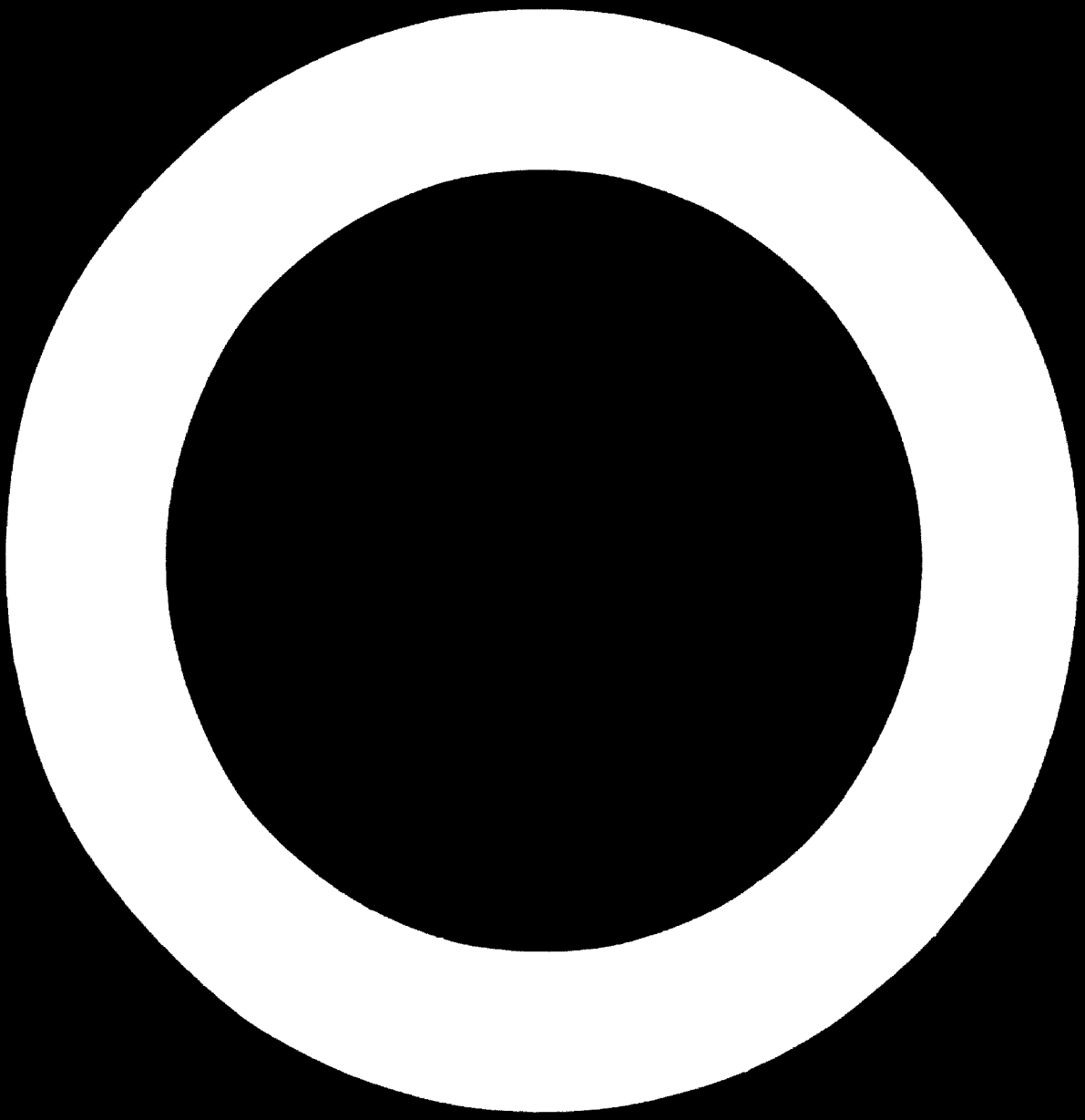
USED CHEMICAL PROCESS EQUIPMENT SOURCES. USE, SELECTION CRITERIA, WITH PARTICULAR REGARD TO ITS APPLICATION IN DEVELOPING COUNTRIES

by

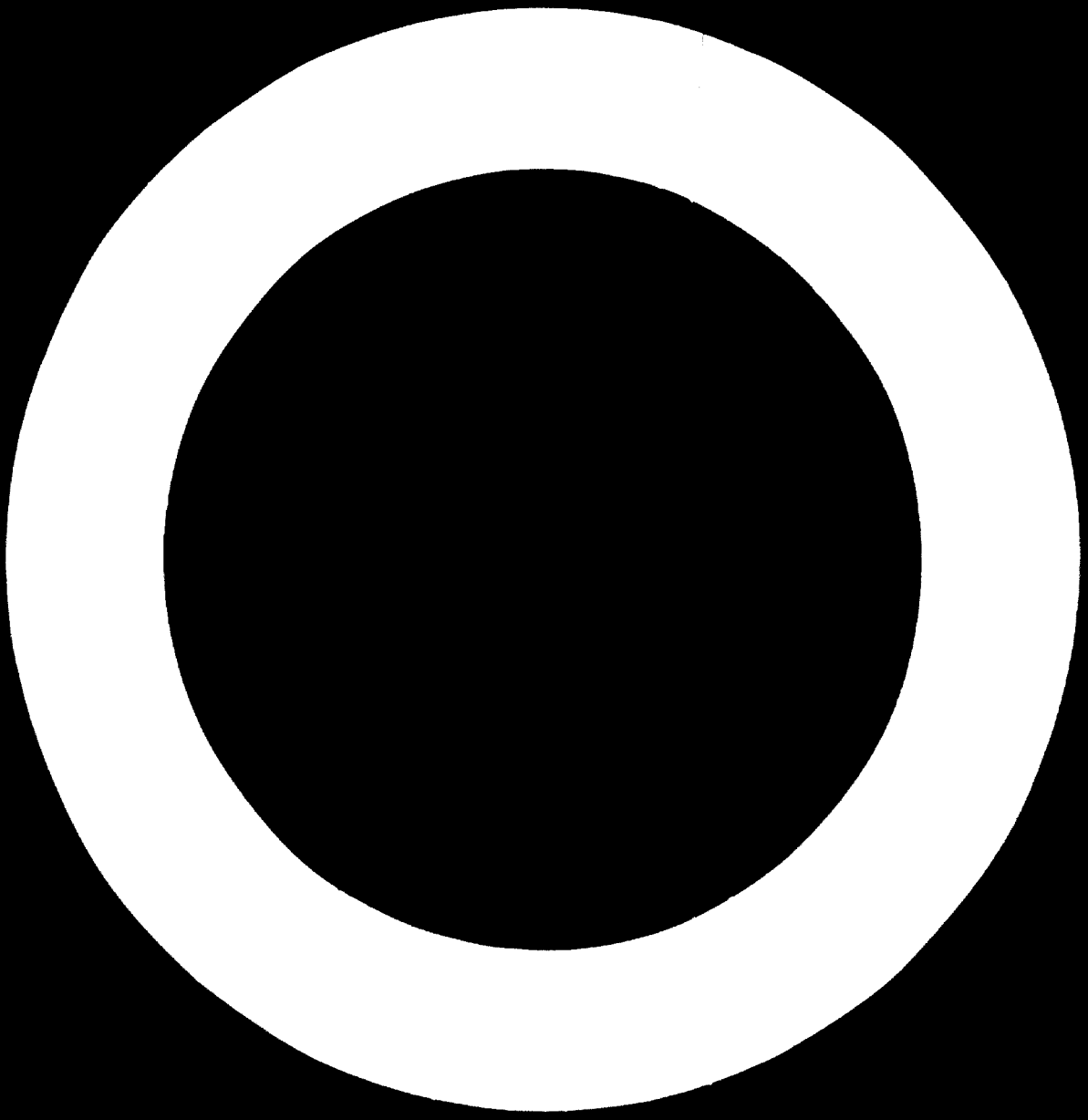
Norman E. Parker, P.E.



A STUDY FOR THE UNITED NATIONS CONCERNING USED CHEMICAL PROCESS EQUIPMENT SOURCES, USE, SELECTION CRITERIA WITH PARTICULAR REGARD TO ITS APPLICATION IN DEVELOPING COUNTRIES

by

Norman H. Parker, P.E.



SUMMARY

Second hand chemical process equipment is widely used in the United States, particularly by companies whose first interest is minimizing capital investment in equipment. It is important to emphasize that the availability of this equipment is primarily the result of technical innovations in processes and not due to obsolescence of the equipment itself. Rather than individual pieces of equipment, the report will deal with the two basic categories "mechanical equipment", and "plate fabrications". The requirements for maintenance and spare parts are similar in each category. Selection criteria have been included to assist in the evaluation of second hand chemical process equipment: the need to meet the process requirements of the application; consideration of mechanical condition, spare parts inventory sources and availability, and the available market of skilled and unskilled labor. It is recommended that if second hand chemical process equipment is considered for use in developing countries, each case be considered on its individual merit.

In order to provide a frame of reference for the discussion which follows, we will define the branches of the Chemical Process Industries in accordance with current practice in the United States. The table of industry branches which follows is in accordance with the listings found in the U.S. Census of Manufacturers.

Table I - Industry Branch

1- Chemicals - Petrochemicals
2- Drugs and Medicines
3- Explosives and Fireworks
4- Fats and Oils
5- Fertilizers and Agricultural Chemicals
6- Foods and Beverages
7- Leather Tanning and Finishing
8- Lime and Cement
9- Man-Made Fibers
10- Metallurgical and Metal Products
11- Paints and Allied Products
12- Petroleum Refining and Coal Products
13- Plastic Materials
14- Rubber Products
15- Soap and Related Products
16- Stone, Clay, Glass and Ceramics
17- Wood, Pulp Paper and Board
18- Other Chemically Processed Products

Because it is difficult to single out particular pieces of chemical process equipment which would be sufficiently representative in their use in all these industry branches, we will consider two broad categories into which most chemical process equipment can be divided: (a) mechanical, which includes all equipment with moving parts; and (b) plate fabrications which normally have no moving parts. Not included in the discussion will be pumps, valves, and process piping, to which, however, many of the comments apply.

Typical equipment in the mechanical category:

Table II

Rotary Dryers	Kilns	Drum Dryers
Rotary Filters	Plate and Frame Filters	Pulverizers
Centrifuges	Spray Dryers	Ball and Hammer Mills
Mixers	Blenders	Mechanically Aided Evaporators
Expellers	Extruders	Colloid Mills

The wide range of mechanical equipment used in drying is illustrated in Appendix A.

Typical plate fabrications include:

Table III

Autoclaves	Heat Exchangers
Collectors	Kettles
Columns, Fractionating, Distillation	Reactors
Evaporators	Tanks
Condensers	Towers

In the discussions which follow, we will use the general terminology "mechanical equipment" and "plate fabrications", selecting examples of such specific equipment in each group which may illustrate a point under discussion. A special problem is generated in the Chemical Process Industries unique to this industry, which is independent of the category in which the equipment falls: the process requirement or performance specifications to which the equipment will be subject. Almost all equipment in the general category of "mechanical equipment" is designed for the specific application in which it is installed. The design criteria are based on the process requirements of the system. The process design criteria for the plate fabrications such as reactors and autoclaves are relatively simple, becoming more complex for equipment involving heat transfer such as evaporators, or heat and mass transfer such as distillation columns.

In categorizing the equipment as either mechanical or plate fabrication, we have also created two broad end use classifications. Essentially, the mechanical equipment performs operations on the material passing over or through it. In another sense, the role of this type of equipment in chemical processing is an active one. Plate fabrications, on the other hand, generally have a passive role, in that processing steps can be and are performed in them. Equipment such as columns, condensers, or reactors do not themselves perform any physical work. In the case of mechanical equipment, Unit Operations in chemical processing are performed by them, in the case of fabrications, in them.

Very little equipment in the Chemical Process Industry is standard in the sense that certain types of machine tools, such as lathes, drill presses, milling machines, or boring mills are. Although drying equipment, evaporators, pumps or even heat exchangers can be composed of standard sub-assemblies, their overall performance is geared to the process in which they are installed. In most cases, major chemical process equipment does not have a simple turndown factor which would permit it to be operated at rates much lower than design without major changes in the operating variables.

This single factor influences both the availability and utilization of used chemical process equipment in the United States.

The primary sources of used chemical process equipment are the major chemical manufacturers whose products or processes change, requiring new, larger, or different equipment. Existing equipment becomes surplus. It is important to emphasize that this does not mean that the original equipment itself is obsolescent or obsolete. Technological innovation is primarily in processing rather than equipment, and the appearance of a piece of equipment on the used market means only that the need for the equipment, or the service for which it was originally selected and purchased, no longer exists.

Fortunately, it is only infrequently that a piece of equipment which has been abused to the point of being almost devoid of value mechanically and performancewise is put on the used equipment market. In most cases such as this, reputable used equipment dealers will scrap the equipment rather than offer it for sale.

A specific example of a trend in technological innovation which has brought equipment into the used market follows:

Traditionally, dyestuffs manufacture has been by batch process. After completion of the reaction, the next process steps have been batch filtration on plate and frame filter presses, followed by drying in shelf dryers and particle size reduction in a pulverizer. These process steps are satisfactory for low to moderate production requirements, and especially suited to companies producing a wide variety of products. As the need for increased production of any one product has grown, so has the need for more rapid processing, with corresponding decrease in material handling and manual labor.

The solution to continuous operation, volume production and reduced labor requirements was found in solution drying, using a spray dryer. One spray dryer replaces at least one filter press, one or more shelf dryers, and a pulverizer, generally producing a better quality product. At the present time, there is still a larger percentage of dyestuffs produced by batch drying methods than by spray drying, but use of the latter is growing.

This pattern is occuring in varying degrees in many unrelated branches of the chemical process industries, accounting in part for used equipment available.

Another contributing factor to the availability of used equipment are plants whose operations have become marginal. In this category are those whose labor factor is disproportionate because of failure to initiate improvements. It is only in rare cases that anticipated product market growth pattern has not materialized or continued, resulting in a management decision to liquidate its investment.

Again, it is important to emphasize that it is most unlikely that a

particular piece of chemical process equipment will become obsolete, but rather its use in a particular operation or process has been made unnecessary by a factor other than the equipment itself.

The cost of used chemical process equipment varies not only with the type of equipment, but with the cost to the dealer, physical condition, degree and cost of any reconditioning required, and the manner in which it was acquired by the dealer.

As a generalization, it is possible to say that mechanical equipment will sell on the used equipment market for as little as 25% to as much as 50% of its original replacement cost. Plate fabrication, particularly tankage, may sell for 70% of its original replacement cost.

There are two basis on which used equipment only is offered for sale: (1) reconditioned; or (b) "as is, where is". Again, as a generalization, it can be said that if a piece of equipment is too large to move economically, or to recondition in the dealer's plant it is sold: "as is, where is". Specific examples of the latter category taken from a dealer's listing of used equipment:

1) 37,700 sq. ft. (heat exchange surface) T-316 stainless sextuple effect evaporator, with accessories.
2) 10" x 165" rotary kiln, 3/4" shell, with accessories and drive.

Typical of the former category would be the following:

1) Buflovak 42" x 120" double drum dryer
2) Bowen 5' diameter stainless steel lab spray dryer
3) Rodney Hunt 9 ft. sq. T-316 wiped film evaporator
4) Oliver 8' x 6", 150 sq. ft. vacuum filter, T-316

The selling price of used equipment as a proportion of original cost is also related to the process design factor previously mentioned: the degree to which the equipment was tailor-made to the process equipment. As was previously noted, this fact differentiates chemical process equipment from most other manufacturing equipment. A lathe can be used to machine steel, stainless, or any other type of metal, wood or plastic. A shoe

stitcher may be more or less sophisticated for mens' or childrens' shoes. However, a distillation column designed to separate two components at a specific feed rate whose boiling points are only 1°C apart may not be readily adaptable to any other process or feed materials without major construction changes.

To rephrase the example above, in dealing with chemical process equipment in general, the more sophisticated the process design criteria, the less flexibility the equipment may have in other processes, the less desirable it may be on the used equipment market, and the lower the price. However, from the prospective purchaser's viewpoint, the price should not be the criterion of the usefulness to him, but rather that it can be adapted to his process.

From a sales standpoint, the Vice President of one used equipment dealer listed chemical process equipment in the following order:

1) glass lined tankage
2) stainless steel tankage
3) centrifugal filtration equipment, vacuum drying equipment, mixers
4) pumps (as is, never reconditioned)
5) columns: 1) packed; 2) tray types
6) special equipment designs

This can be said to reflect the degree of specialization of the equipment to the particular process for which it was originally designed and purchased, and the degree of flexibility inherent in the equipment.

The factor of process design must be considered from another point of view in connection with utilization of used equipment in developing countries. While every reputable used equipment dealer will give a mechanical guarantee on equipment he has reconditioned, there is no process guarantee whatever, as is available with new equipment. It is the purchaser's responsibility to ascertain, by design calculation or otherwise, that the equipment to be purchased will perform in the service for which it is being considered.

Unfortunately, in most cases there is very little operational data available from the used equipment dealer, usually because it was not made available to him. The usual source for original design data is the original equipment manufacturer, most of whom have been reluctant to provide free engineering services directly to used equipment dealers. However, rather than risk their reputation because of a misapplication of their equipment, especially in a foreign market, they can be expected to be cooperative. There are those, of course, who would feel it was their obligation to any purchaser of equipment to do so, just as the reverse is also the case. Most equipment manufacturers will for a fee, usually a per diem of $100.00 to $150.00 plus expenses, send a trained factory engineer to inspect a used piece of their equipment and determine its present state of repair, reconditioning required, and potential operating life. In connection with this service, they will provide lists of recommended spare parts together with prices and lead time for delivery.

The primary consideration, therefore, in the selection of used chemical process equipment for use in developing countries should be suitability for and to the process application.

The second consideration, of almost equal importance, is the physical condition of the equipment. In this regard, it is not simply a question of whether or not the equipment has been reconditioned, but whether the original use has in any way impaired its applicability to the service for which it is being considered.

For example, most double drum dryers are designed to use steam as the heating medium for the drums. American manufacturers rate their drums in terms of pounds per square inch gage pressure (PSIG) they are designed to withstand under such standard criteria as the ASME Code for Unfired Pressure Vessels, which specifies design formulae based on size, material of construction, and desired internal pressure rating.

Depending upon the particular service requirements of the application, and a number of other factors, a drum dryer may require to have its drum

surface machined as often as once a year. On the other hand, some dryer drums never require machining.

For those which do, although each machining may remove only a few thousandths of an inch of material from the shell thickness, the shell thickness can eventually be reduced to the point that the drums must be re-rated for some lower maximum internal pressure than originally designed for.

There are a number of other factors which can contribute to the need for this type of re-rating, but the end result is what must concern the potential buyer.

If a buyer obtains a drum dryer whose drums have been machined but not re-rated to a lower operating pressure, he may be operating an extreme safety hazard. On the other hand, if the unit has been re-rated for a lower steam pressure in the drums, the unit will have to be operated at a reduced capacity or fail to produce a dry product. This reduced capacity could be as low as 50-60% of original design capacity.

There have also been those cases in which drums have been so severely misused as to develop an oval cross-section. In most cases, this is not apparent to a prospective purchaser, just as it may not have been to the used equipment dealer when he bought the equipment. In many cases there is no alternative, in order to make the equipment operative, to replacing at least one, or more usually both drums.

Whenever a used equipment dealer has been unable to obtain operational data from the original equipment purchaser, it is almost invariably true that maintenance information, schedules, or data will be lacking too. This adds an additional burden on the shoulders of the purchaser of used chemical process equipment.

In general, it may be said that any type of mechanical equipment for chemical processing can present a similar maintenance or reconditioning problem. To develop an example of each is beyond the scope of this paper.

Somewhat related problems arise with fabricated equipment such as tray type, distillation columns. We refer here to any type of column having permanent internals, not those which fall into the category of packed columns, where the packing is removable.

Distillation columns or towers generally fall into two categories when taken out of service: salvageable or scrap. Those which may be considered salvageable by the user may still be considered scrap by the used equipment dealer. But even those which pass dealer scrutiny may contain hidden headaches for the potential user.

The material of construction most frequently used in fabricated chemical process equipment in the United States is stainless steel for protection against the corrosive effects of the chemicals being processed. From the standpoint of further usability, this is an advantage.

However, the general corrosion resistant quality of the material tends to blind users to the fact that there are other types of failures to which all metals are subject, to which stainless is equally prone. One of these is stress corrosion which can result from any of the mechanical work of forming the material to its final shape. The effects of this type of corrosion may not become apparent until equipment service is changed, and new material processed.

An excellent example of a problem of this type occured in connection with a distillation column for purification of vinyl chloride. The unit was constructed of stainless 316, and had been in service about 5 years. During a yearly maintenance check up, a minor repair was to be made at a connection on the bottom head. Upon checking the head with penetrant dye, it was found that stress cracks, invisible to the naked eye, had developed in all areas where cold working had been done in forming the head from a piece of plate. A new head had to be manufactured for the unit. This one was hot formed, then annealed and pickled to minimize the possibility of stress corrosion developing again. Fortunately, further examination of the column with the penetrant dye indicated no other apparent areas where stress corrosion was taking place.

There are two additional factors which need to be evaluated in connection with any installation of used chemical process equipment in developing countries: (a) repairs; and (b) spare parts.

Naturally, the amount of each will depend primarily upon whether the equipment falls in the mechanical or fabricated plate category. It is reasonable to make the generalization that plate fabrications require little or no spare parts inventories; for mechanical equipment, in general, this will vary from small to large, depending upon the complexity of the equipment.

On mechanical equipment, repairs must be considered to consist of four separate and distinct operations: (a) analysis and definition of the problem; (b) disassembly leading to the exposure of the part; (c) removal and replacement; (d) re-assembly. As in medicine, there are times when some degree of exploration is necessary to expose the actual source of difficulty after a preliminary analysis has been made.

To be realistic, it is necessary to face the fact that as the degree of sophistication or complexity of mechanical equipment increases, so does the level of skills required to service it, as does sometimes the size and type of machinery required to perform major repairs.

Typical of the personnel and equipment required for maintenance and repair of the simplest plate fabrication, such as a stainless storage tank, would be a welder with electric welding equipment, oxy-acetylene gas welding and cutting equipment and a supply of the correct material of construction. An excellent example which illustrates the degree of independence which can be achieved was the maintenance facility built and operated at the Cuban Nickel Co. plant at Nicaro, Cuba. The facility included a foundry, pattern shop, machine shop, and all manner of equipment required to remove and rebuild any part of the process equipment used in the plant.

In general, used chemical process equipment on the market today can be expected to have at least half its useful life ahead of it, with some

variations on particular types. There are some reaction vessels in operation today after 15 or more years of continuous service. As pointed out earlier, where equipment has become available because of product or process innovations, the equipment itself is not made obsolescent or obsolete by this. Fortunately for both the original equipment purchaser and the used equipment purchaser, manufacturers of chemical process equipment have not joined the trend to planned obsolescence observed in many industries catering directly to consumers. This is, of course, in part, due to the rigid design engineering and manufacturing specifications to which materials and components are subject. Naturally, where improved materials or components are available, these are included by most equipment manufacturers. The advantages to the user of the basic conservatism in both design codes and manufacturing standards is that properly maintained process equipment, unless subject to some unusual process conditions, some of which we have indicated, can be expected to have a service life of at least twenty years. Again, because technological innovation in the Chemical Process Industries has been primarily process oriented rather than equipment oriented, replacement parts for certain types of equipment are the same today as they were twenty years ago. Where this is the case, the total service life of a piece of used equipment may be extended to the point at which the equipment is scrapped by the purchaser as process innovations or improvements eliminate the need for it.

It is difficult to put comparable numbers on used chemical process equipment because of the number of variables which must be evaluated. Technological innovations in chemical processing do not result in development of completely new equipment which makes obsolete an entire type of existing equipment. Equipment maintenance varies widely from plant to plant. As a result of the inherent quality of design and manufacture, two identical pieces of equipment in the same service may be in the identical excellent condition after 5 years of operating during which one had no regular maintenance and the other regularly scheduled

maintenance. On the other hand, a slight change in formulation may produce a severe corrosion in one piece of equipment, while the second, operating on the initial formulation, will have had no corrosion problem at all.

In fact, the selection of a piece of used chemical process equipment is similar to the selection of a piece of new equipment. The criteria are:

1) Is it the right piece of equipment for the application?
2) Does it meet the process requirements for capacity and product quality?
3) Does the mechanical design satisfy any special criteria or design codes set up for equipment of its type?
4) Is the equipment in good operating condition mechanically, and is this condition guaranteed?
5) What stock of spare or replacement parts does the manufacturer recommend; are other local sources for these parts available; what provision must be made to perform major repairs; special facilities or equipment; highly skilled labor; special materials of construction?

Each of these criteria must be considered for each piece of used equipment. The answers can be different for each plant, each branch of the chemical process industry, and for each country in which a plant is to be installed.

Just as the used chemical process equipment market has provided a source of lower cost equipment for smaller chemical companies with limited capital and resources, so it can serve the needs of developing countries.

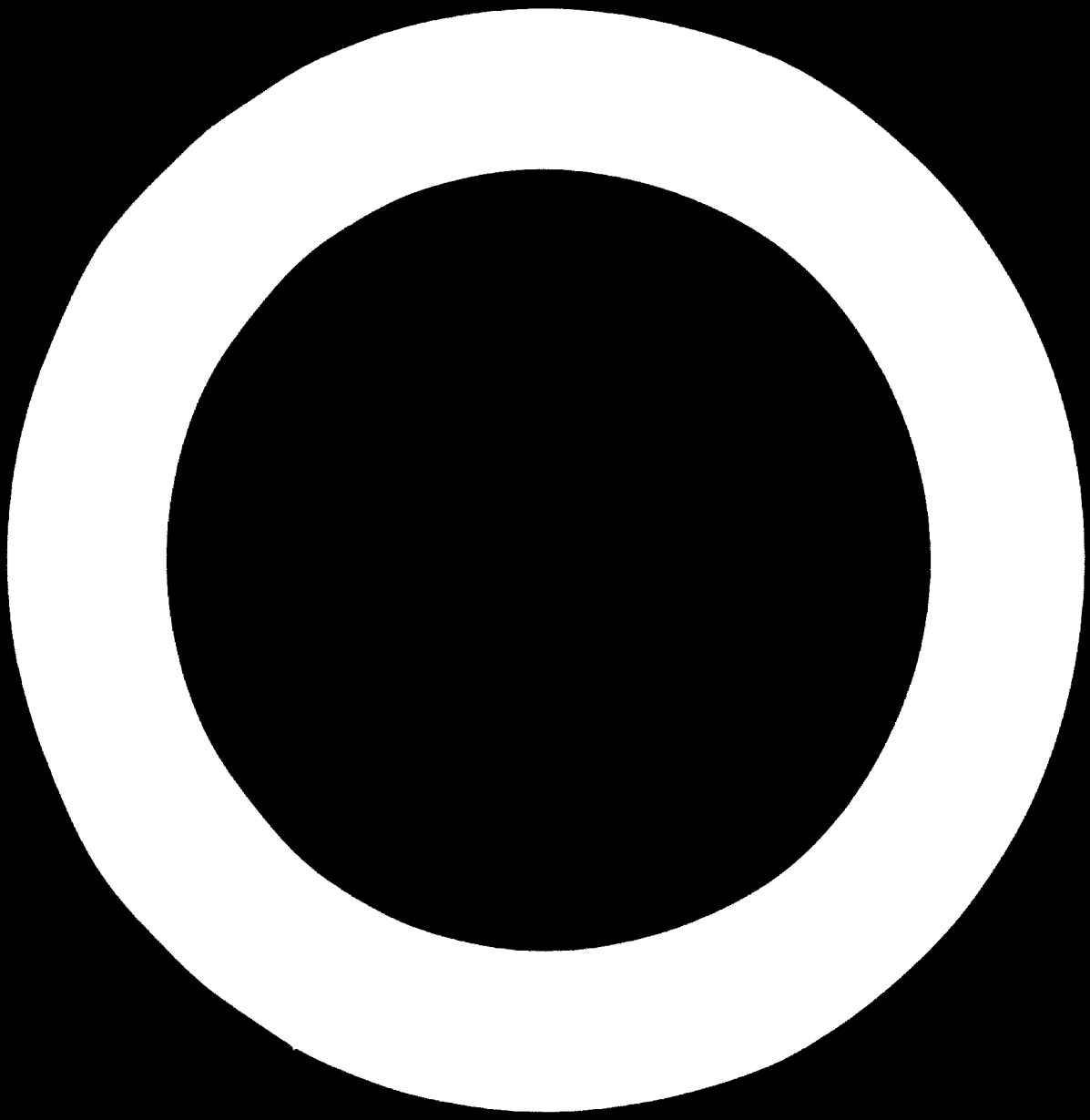
Just as it is important in the purchase of any used equipment to be aware of the potential problems inherent in the equipment, it is especially important to be aware of them in the purchase of used chemical process equipment. It is equally, if not more important, to know how, and with what, to overcome problems which may arise.

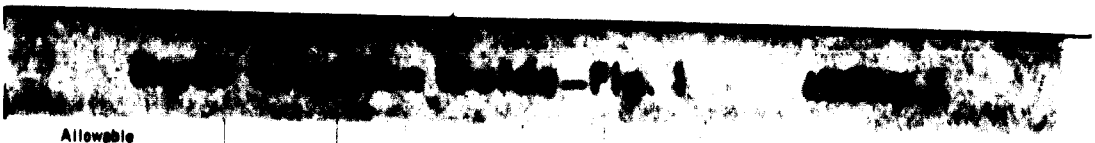
It is unfortunate that in the case of chemical process equipment, there is no simple yardstick or formula to evaluate its suitability to serve the needs of developing countries. It is not simply a question of economics, or the fact that the equipment is operable in its "as is" condition. Leaving out of consideration entirely the question of capability of the equipment to perform the process operation, the advantages of lower first cost may be offset by unanticipated costly and more frequent maintenance. The saving in first cost may be offset by the cost of an extensive inventory of spare parts required because of lead time to obtain replacements. Complexity of mechanical equipment may require high labor skills to operate and perform even simple maintenance.

In considering the use of used chemical process equipment, the only conclusion which is justified is that each purchase must be evaluated on its own merits, giving appropriate weight to each of the factors discussed, with first cost being the last consideration.

APPENDICES

1) Selection Chart, Dryers
2) List of United States dealers in used Chemical Process Equipment
3) Typical listing of equipment available
4) Typical listing of complete plants available





Code of Operation	Generic Type	Allowable Feed Condition (See Key) 1	2	3	Specific Dryer Types	Jacketed	Suitable For Heat Sensitive Materials	Suitable For Vacuum Service	Retention Or Cycle Time	Heat Transfer Method	Capacity	Typical Evaporation Capacity lb H_2O hr./sq. ft. [a]
Batch	Stationary				1. Shelf 2. Cabinet 3. Compartment	Yes	Yes	Yes	6-48 hr	Radiant and Conduction	Limited	0.03-0.20
					Truck	No	Yes	No	6-48 hr	Convection	Limited	0.03-0.20
					1. Kettle 2. Pan	Yes	No	Yes	3-12 hr	Conduction	Limited	0.3-3.0
					Rotary shell	Yes	Yes	Yes	4-48 hr	Conduction	Limited	0.1-2.5
					Rotary internal	Yes	Yes	Yes	4-48 hr	Conduction	Limited	0.1-2.5
					Double cone	Yes	Yes	Yes	3-12 hr	Conduction	Limited	0.1-2.5
Continuous	Drum				1. Single drum 2. Double drum 3. Twin drum	No	Yes	Yes	Very Short	Conduction	Medium	1.10
	Rotary				Rotary, direct heat	No	No	No	Long	Convection	High 1.0 (b)	0.2-7 lb. cu. ft. dryer volume
					Rotary indirect heat	No	No	No	Long	Conduction	Medium 0.7 (b)	1.0-12 lb. cu. ft. dryer volume
					Rotary, steam tube	No	Depends on Material	No	Long	Conduction	High 3.0 (b)	1.0-12 lb. cu. ft. dryer volume
					Rotary direct-indirect heat	No	No	No	Long	Conduction Convection	High 1.35 (b)	4-9 lb. cu. ft. dryer volume
					Louver	No	Depends on Material	No	Long	Convection	High	0.3-15 lb. cu. ft. dryer volume
	Conveyor				Tunnel belt, screen	No	Yes	No	Long	Convection	Medium	0.3-7.0
					Rotary shelf	Yes	Depends on Material	No	Medium	Conduction Convection	Medium	0.1-2.0
					Trough	Yes	Depends on Material	Yes	Varies	Conduction	Medium	0.1-3.0
					Vibrating	Yes	Depends on Material	No	Medium	Convection Conduction	Medium	0.1-20.0
					Turbo	No	Depends on Material	No	Medium	Convection	Medium	0.2-2.0
	Suspended Particle				Spray	No	Yes	No	Short	Convection	High	0.1-3.0 lb. cu. ft. dryer volume
					Flash	No	Yes	No	Short	Convection	High	(c)
					Fluid bed	No	Yes	No	Short	Convection	Medium	(c)

= applicable to feed conditions noted = applicable in certain instances

Key to feed conditions

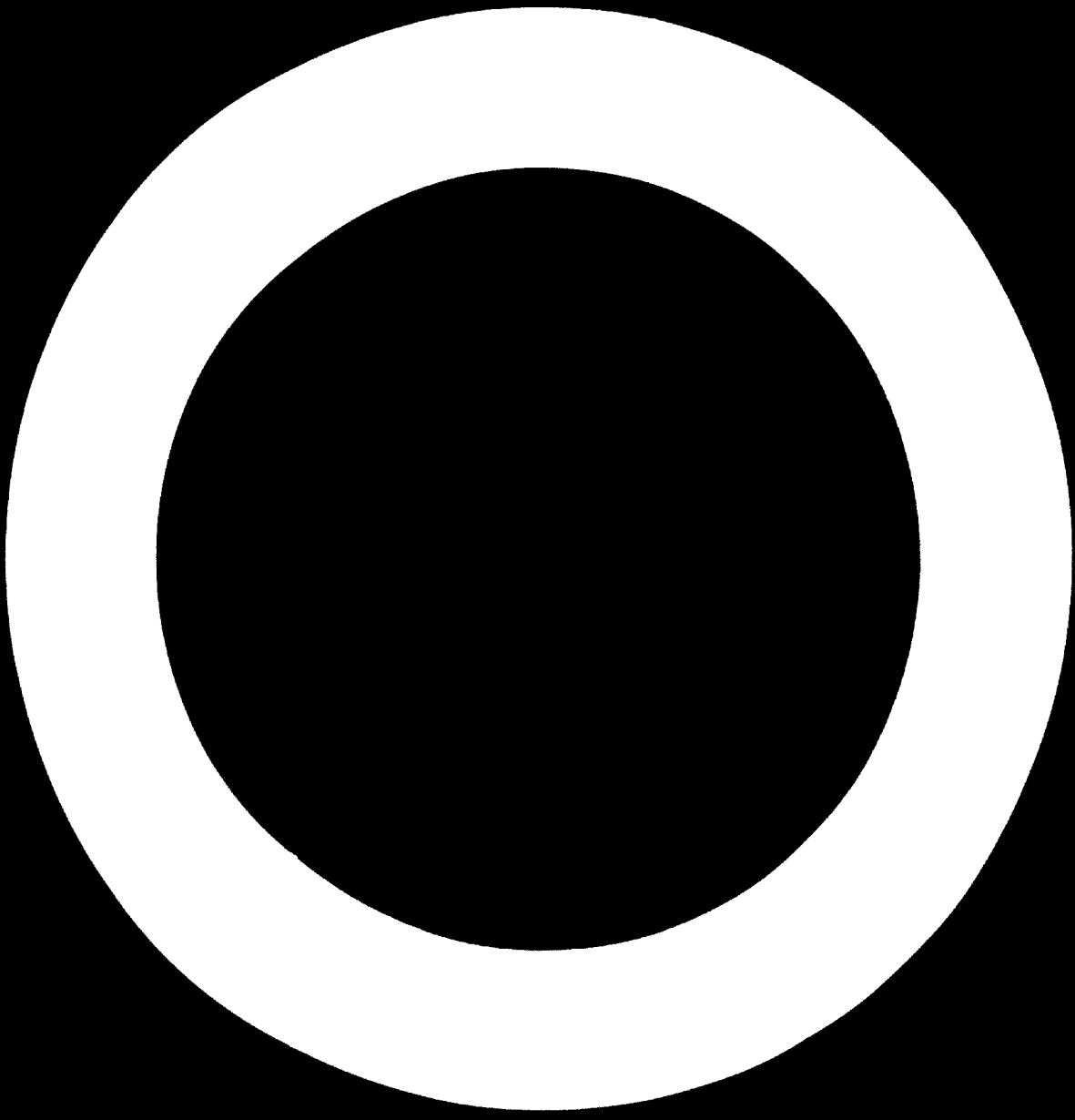
1. Solutions, colloidal suspensions and emulsions, pumpable solids suspensions, pastes and sludges.
2. Free-flowing powders, granular, crystalline or fibrous solids that can withstand mechanical handling.
3. Solids incapable of withstanding mechanical handling.

Notes

(a) Capacity rated as lb. H_2O/hr./sq. ft. heat-transfer surface except as noted.

(b) Comparative capacities of rotary dryers (except louver) using direct-heat rotary dryer capacity as 1.0.

(c) No generalized capacity data available.



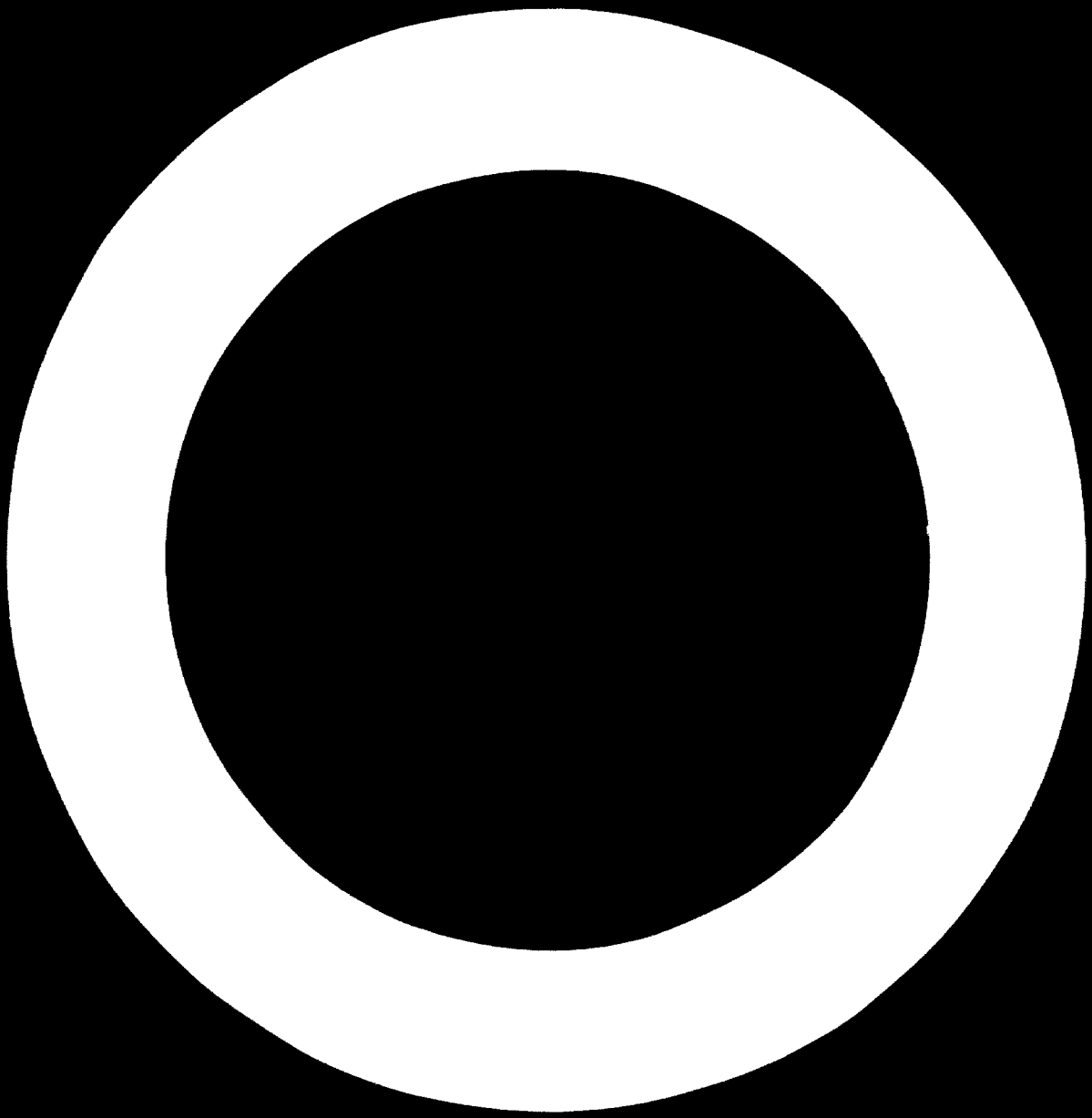
APPENDIX 2

USED CHEMICAL PROCESS EQUIPMENT DEALERS

1) A-1 Equipment & Chemical Co., Chicago, Ill
2) Aaron Equipment Div. of Areco, Inc., Schiller Park, Ill
3) Best Equipment Co., Chicago, Ill
4) Brill Equipment Co., Newark, N.J.
5) Equipment Clearing House., Brooklyn, N.Y.
6) First Machinery Corp., Brooklyn, N.Y.
7) R. Gelb & Sons, Inc., Union, N.J.
8) H. & P. Equipment Co., Inc., Weehawken, N.J.
9) The Lawler Co., Metuchen, N.J.
10) Machinery & Equipment Co., San Francisco, Calif.
11) Madison Equipment Co., Chicago, Ill.
12) Perry Equipment Corp., Philadelphia, Pa.
13) Union Standard Equipment Co., Bronx, N.Y. & Chicago, Ill.

Note: (1) The above listed concerns advertise nationally. There are others who serve very local areas who would only be listed in trade publications serving their immediate vicinity.

(2) Listing is only alphabetical. Facilities, reliability, and reputation must be judged by visit to each dealer's plant.



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APPENDIX 3

VL-965

VALUE LINE

DRUMS

30 gallon type 304 (Extra Low Carbon) Stainless Steel drums; 18" OD x 30-3/4" H. ICC Spec. #5C, 16 ga. construction - steel roll hoops & foot rings with bungs. Excellant condition. "Buy them by the DOZEN!"

* * * * * * * * * * *

EVAPORATOR

Blaw Knox wiped Film Evaporator, 180 sq.ft. heat transfer area T304 St. St. clad contact parts. 32 blade vertical agitator. Jacketed. UNUSED SAVE 75% of original cost.

* * * * * * * * * * *

KILN

Allis Chalmers 10' dia. x 165' long, 3/4" thick shell 2 tires; 16" girth gear and pinion; firing hood. (3) units available. Now dismantled and on rail sidings for easy inspection & quick shipment!

* * * * * * * * * * *

CENTRIFUGAL

Baker Perkins NS54 "Teer Near" Centrifugal Nickel contact parts 54" dia. perforated basket on horizontal axis 12 cu. ft. cake capacity. 12 station automatic Hydraulic system for charging washing and discharging dry product. If you are considering ANY type of Perforated Basket Centrifugal - CHECK THIS HIGH CAPACITY UNIT!

* * * * * * * * * *

CHECK OUR OTHER SPECIALS

- Z5464 - AIR CONDITIONING - 30 ton water chilling plant
- Z5607 - ATTRITOR - Szegvari, type B, size 60
- Z5374 - AUTOCLAVE - 7' D x 36' L Autoclave - Vulcanser, Q.O Door 100 PSI
- Z2107 - AUTOCLAVE - 10' D x 54' L, 125 PSI
- Z4312 - BANDER - Col-O-Seal Machines, Gisholt or World
- AC-Y-11 - BLOWER - Roots-Connersville 11,350 cfm @ 14.7# inlet 19.7# discharge. 350 HP motor & speed increaser.
- Z4100 - BLOWER - R-C Positive Blower 12 x 30, 50 HP
- Z5322 - BOTTLING LINE - Pneumatic Scale, 30 spout filler
- 10942-5 - BOILER - York-Shipley 100 HP oil fired 125 PSI
- 10692-84 - BOILER - Vapor Corp. "Modulatic" water-tube package boiler 5500# steam/hr. @ 275 psig.
- Z4677 - BOILER - Erie City Water-tube; 30,000# steam/hr. @ 160 PSI
- RM-04-1 - BOILER - DOWTHERM - Foster Wheeler 2,200,000 BTU
- Z5714 - CARBOYS - 13 gallon carboys, poly bottle plywood cover.
- Z3611 - COMPRESSOR GAS - I-R Model IRE-1 3780 cfm @ 19 PSI - 300 HP
- 10849-4 - COMPRESSOR-AMMONIA - Vilter 8½ x 8½ V-belt 75 HP
- RM-PC-1 - COMPRESSOR-AIR - I-R #XVO 16½ x 16½ x 12; 1700 cfm @ 10 psi
- GEN-1 - CENTRIFUGALS-BASKET - All sizes 12" to 48" suspended, underdriver & Automatic - Steel, St. St. or rubber lined - Ask us for quote on your needs!
- 10810 - CENTRIFUGAL - Bird continuous 18 x 28 St. St. Contour Bowl
- Z4796 - CENTRIFUGAL - DeLaval PX213 Self opening for sludge removal
- Z5309 - CENTRIFUGAL - Dorr-Oliver PC-30
- Z5223 - CENTRIFUGAL - Merocne Model C-400, St. St. 30 HP
- Z4059 - CENTRIFUGAL - Podbielniak #9700 Chemison St. St.
- Z4453 - CENTRIFUGAL - Reinvald 50" Continuous
- 10950 - CENTRIFUGAL - Sharples AS-16V, St. St. Clarifier - like new
- 10737 - CENTRIFUGAL - Sharples 16HP "No Foam" type St. St.
- BOP-3849 - CENTRIFUGAL - Sharples C-20 Super-D-Hydrator St. St.
- Z5595 - CENTRIFUGAL - Sharples P-2000 Super-D-Canter St. St.

Z5276 - CAN CLOSER - Continental Model 306-C-1 & 306-CB-1
10755 - DUST COLLECTOR - Sly Type A, St. St. 6800 cfm 1264 sq.ft.
Z3935 - COLUMN-GLASS - 9" x 17' Column with 100 liter flask
RM-A-2 - COLUMN - Bubble Cap 30" D x 27 plate T316 St. St.
RM-A-103 - COLUMN - Bubble Cap 60" D x 20 plate T316 St. St.
Z5349 - COMPACTOR - Fitzpatrick "Chilsonator" 6" D x 7" L Rolls
Z4959 - CONVEYOR-ZIPPER - 300' long Zipper Belt Conveyor
11015-1 - CONVEYOR - Vibrating - Carrier 18" W x 31' L Natural Frequency, St. St
Z5188 - COOKER - Western Precipitation "Holo-Flite", Size D1416-6
10695-2 - COOKER - Rennebery 12" dia. x 30' long Jacksted screw; St. St.
Z4091 - CURSHER; Gyratory Model 19½ Kennedy Van Saun 25-30 HP
Z5375 - CRUSHER - Gyratory Allis Chalmers #3-22 Hydro-Cone.
10728-12 - CRUSHER - Jaw Birdeboro 10" x 16" - V-belt 15 HP
Z5591 - CRUSHER - Jaw Pioneer 3042; 150 HP
11004 - CRUSHER - CONE, Symons 2' Standard, 50 HP motor.
10373-1 - CRYSTALLIZER, Swenson 8' D Vacuum Batch, Rubber lined
Z5117 - CRYSTALLIZER; Krystall Type 316 St. St. Cap 3000 lb/hr.
Z5494 - CUTTER - Cumberland 14" pelletizer 8 knife rotor
10945-7 - CUTTER - Black Rock Guillotine, 12" stroke; 20" W blade
NL4-25 - DEHUMIDIFIER - 625 SCFM @ 100 PSI, Steam regeneration
GEN-2 - DRYER DOUBLE DRUM - All sizes 24 x 36, up to 42 x 120" - Tell us what size you NEED!
Z4398X - DRYERS TWIN DRUM - 32 x 72 & 32 x 90;
RM-F-1 - DRYER SINGLE DRUM-FLAKER - 30" x 60" Stokes Stainless Steel
GEN-3 - DRYER ROTARY HOT AIR - 3' x 20' up to 10' x 60' - all sizes - Tell US what you NEED!!
Z5732 - DRYER ROTARY KILN - Vulcan 9' x 120'; 11/16" welded shell
10728-3 - DRYER ROTARY KILN - Traylor 6'6" D x 62' long 5/8" shell
Z3149 - DRYER ROTARY KILN - Bartlett & Snow 4' D x 20' L
Z5587 - DRYER STEAM TUBE - Louisville 6' x 50'
Z3120 - DRYER STEAM TUBE - Louisville 6' x 40' Stainless steel
Z5032 - DRYER HEIL - Model SD6-24 Dehydrator.
10637 - DRYER VACUUM - Patterson 13 cu.ft. Conical "Conaform" Jkt. Stainless Steel - Explosion Proof Drive.
10953-4 - DRYER SPRAY - Bowen Lab Size Stainless Steel
Z5472 - DRYER CONVEYOR - Sargent 14" W x 10' L, St. St. Belt
11011 - DRYER VACUUM SHELF - Buflovac F-17; 196 sq.ft.
10640 - DRYER PAN - Bartlett & Snow 6' dia. A-37; Jkt., Agit.
Z4814 - DRYER FLUID/BED - Witte air vibrating fluid bed Dryer
9766 - EVAPORATOR - Blaw Knox Double Effect 710 sq.ft. St. St.
GEN-4 - EXCHANGERS - All sizes 50 sq.ft. to 4000 sq.ft. shell & tube - Stainless steel - NEW & USED
10977 - EXTRUDER - MPM 3½" Extruder with Blow molder
10945-1 - EXTRUDER - National Erie 8½" Rubber Extruder-Strainer
CZ-5-3 - FEEDER - Jeffrey 30" x 18'3" open pan vibratory
11029 - FILLER-BAG - Consolidated "A" for 100 lb open mouth bags
Z5755 - FILLING LINE POWDER - for cartons 5" W x 2-3/4" W x 14"
GEN-5 - FILTERS PRESSURE LEAF: All sizes & Types
GEN-6 - FILTERS ROTARY VACUUM - What Do You Need-We Have It.
10842 - FURNACE, Nichols Herreshoff 5-hearth 2'3" dia.
RM-G-1 - GRANULATOR - Stokes #243-K, Oscillating St. St.
Z5663 - ICE MAKER - York Flake Icer 15 ton/day
GEN-5 - KETTLES - REACTORS - NEW & USED All Sizes advise capacity & pressure requirement for "QUICK QUOTE"
10710 - MILL,CONICAL - Hardinge 6' x 36", Hi-Hard Liners.
10649-3 - MILL,PEBBLE, Patterson 6' D x 10' L Porcelain lined
10988-2 - MILL,PELLET, Sprout Waldron Model 5004
10945-29 - MILL 2-ROLL, Thropp 20" x 22" x 60 - Top cap
10836 - MILL HAMMER - Unused Penna C-1-24 Reversible 40 HP
11019-3 - MILL MIKRO - #4TH; #3TH Stainless Steel
CZ-3-35B - MILL RAYMOND - #45 Imp Mill
10520 - MILL RIETZ - #ROC-18, Stainless Steel 75 HP
Z5204 - MILL STEDMAN - 2-row Cage Mill
Z4747 - MILL MOREHOUSE - Model 84-30, T316 St. St. 20 HP
10988-1 - MIXER H.D. DOUBLE ARM - Baker Perkins 3½ gallon Jkt. other sized up to 200 gallon.
10989 - MIXER POWDER - J.H. Day Hauto Mixer 10 cu.ft.; St. St.
10878-17 - PALLETIZER - Alvey for 36" x 44" pallets
10867 - PRESS HYDRAULIC - Watson-Stillman 30 ton
11019-1 - SCREEN - Sprout-Waldron DC-30 Gyro-Centric
GEN-6 - TANKS - STAINLESS STEEL - We are Tank Headquarters - All sizes NEW & USED!
10597-1 - VOTATOR - Girdler 6" x 48" St. St.
Z2940 - WATER TREATMENT - Permutit, 3000 gal/regeneration

PLEASE: IF YOU DO NOT SEE IT

APPENDIX A

PERRY EQUIPMENT CORPORATION

1421 NORTH SIXTH STREET • PHILADELPHIA 22, PENNA.

PHONE: (215) 763-3505
CABLE "PERI"

MACHINERY AND EQUIPMENT FOR THE PROCESS INDUSTRIES

LIST AP-2

PLANTS

Z2975 - AEROSAL line & Can Line: Aerosal Line has: MRM 10 spout semi-automatic vacuum filler, JG model 14 propellant injector 300 CC capacity with feeder, can twister, accumulating table etc. Can labeler Standard Knapp model B wee handling 8 oz. to 16 oz. cans. Can Line has: M & S 6 station rotary piston filler, American Can model 00-6 closing machine. Crandall single can filler. Both lines last used for fuel additive.

Z2957 - ALMOND nut paste processing plant for grinding & processing almond nut paste including separators, scolders, conveyors, tables, kettle. Complete package with manufacturing know-how furnished.

Z2925 - APPLE SAUCE equipment: with Allan apple sauce cooker 10' long; Indiana Colossae Finisher; M & S 10 pocket bronze plunger filler, Conco 400 closing machine for 303 cans; (9) peace peelers conveyors, kettles, elevators, tables, etc. Immersion type cooler 85' L x 6'8" W with galvanized wire mesh belt.

Z2538 - AMMONIA plant, capacity 20 tons per 24 hour day, with facilities to convert up to 50% of this to aque ammonia. Uses variation of the Haber process to burn hydrogen with air. Hydrogen & nitrogen are compressed to 5000 psi and passed over iron catalyst. Equip. includes (3) I-R compressors with 325 HP motors, (2) 75 ton refrigeration machines, condensers, converters, storage tanks, etc.

Z3034 - BLENDING plant for oil & gas additions. Will mix four additives at once in any proportions desired. Automatic operation, plant will shut off at any gallonage required. Included are (3) 1000 gal. tanks with steam coils and (1) 2500 gal. pressure tank with coils.

Z2932 - BLAST FURNACE plant: Furnace has 15'3" hearth dia., charging equipment, cast house equipment, gas system, steam generating equipment (total 2500 HP), thickner and filter system. Cap. 400-500 gross tons daily depending on product melted. (also avail. electric furnace, capacity 50-100 tons per day).

Z2945 - BREWERY equipment bottling house. Yundt 12 wide washer, Cemco 40 spout filler, Crowner, Yundt pasteurizer, Ermold 6 wide labeler, Beer Meters, Misc. Equip. BREW HOUSE: 170 Bbl. brew kettle, Klein pulp filters, Schlengen pulp fillers, two station racker.

Z2805 - BREWHOUSE: Main items are 230 bbl. Schaek & Guemer mash tub 12'10" dia.; 250 bbl. Lauter tub 17'6" dia.; (2) 260 bbl. kettles 12' dia.; Fuller Airvever System; F. Aue 6 roll malt mill.

Z2948 - BREWHOUSE Equipment: Schoek & Gusmer 230 bbl. mash tub, 12'10" dia.; 250 bbl. capacity Lauter Tub 17'6" dia.; two 260 bbl. brew kettles 12' dia.; airveyor system, Aue 6 roll malt mill.

Z3269 - BRICK making machine for the manufacture of "Dunbrik" which is made from sand, gravel and cement with color added making a variety of colors. Includes mixing tube hoisting equipment and drying racks.

Z3173 - BRICKCRETE Plant consisting of Dunn compactor, mixer, 8 drying racks, 8 assorted molds for brickcrete bricks, sills, corners, tees and patio stones. Approx. 2000 plywood pallets.

Z3109 - CANNING or bottling equipment. Last used by an oil company to put out 2000 cases daily of pints and quarts using screw caps on cans or bottles. Main items are: 25 head bronze Sanico filler, rotary 4 head capper, case sealer and power conveyors. Approx. 10 years old. Reported excellent condition.

Z2860 - COAL WASHING Plant with 20 x 20 Eagle double roll crusher; 50 TPH Montgomery coal washing jigs; Denver Sub "A" flotation unit, bucket elevators, conveyors, etc.

Z2997 - CORN CHIP Processing Line, with cooker to yield 1000#/hr. finished corn chips. Cooker adaptable for natural gas, propane or butane fuel. Withheat exchanger, oil pump, controls, etc. (2) 150 gallon agitated kettles, continuous corn washer, chip salter.

Z2428 - THREE COLUMN ALCOHOL unit, with copper columns, consisting of beer still 54" dia. x 22 plates on 18" spacing;, rectifying column 36" dia. for 35 plates and 42" dia. for 15 plates; heads column 21" dia. x 30 plates on 10" spacing. Included is inter-connecting piping, condensers, preheaters, reboilers, pumps, meters, etc.

Z2477 - DISTILLERY 500 bushel per day. Includes 42" beer still, 42" rectifying column, condensers, cooker, tanks, etc. Also, complete dry house with Louisville dewaterer, steam tube dryer, double drum dryer, Auflovac evaporator.

Z2478 - DISTILLERY 600 bushels (60 bbls.) per day distilling capacity. Includes 60" dia. Spirit Column, 48" dia. beer still, condensers, doublers, dephlegmator, water still, necessary tanks and other equipment. 1 year old 18,000# per hour boiler. Prefer selling as being business with buildings, stored whiskey. Or, will consider sale of all machinery for removal.

Z2917 - EGG BREAKING equipment including (2) automatic belt egg breaking lines: several Barker egg washers; 100 stainless steel tanks 24" dia. x 36" H; st.st. pipe; motors, pumps, etc.

Z3008 - ELECTRIC FURNACE Plant: 8000 KVA Submerged Arc Ferralloy plant with (3) electrate furnaces 22' dia. x 9'6" deep. Transformer 13,200/162.5 volts 8000 KVA, 60 cycles. Rees material handling system; hot metal crane. New 1950.

Z3000 - ELECTRIC FURNACE Melt Shop: two 45 ton top charge Heroult furnaces 15' dia., 12,500 KVA Penns. Transformers, 23,000 volt inbound water cooled holders and masts with powered movement. Max. dia. electrodes 18".

Z2976 - FATTY ACIDS & Hydrogenated Oil, also processes for synthetic wax, esters, emulsifiable prod. Equip. can be modified to produce ethylene oxide or propylene oxide reaction, also 25,000#/day of nitriles or amide and amines from fats. Equip. includes T316SS hydrogenation autoclave, 4000 gal. aluminum filter presses. Fatty acid distillation system w/2000 gal. Ni-resist pots; Dowtherm boiler 3,600,000 Btu. Glycerine evap. 10,000#/water hour, etc.

Z2930 - FISH MEAL reduction plant, 30 ton capacity, w/cookers, dryers, tanks, conveyors, presses, pumps, grinders, etc. Complete plant.

Z3002 - FLAT ROLLED Equipment: United 3-hi rougher, 1200 HP motor & drive, Long Terne coating line, core plating line, Strains peak shear, waste heat boilers, Kane & Roach 28 straightener, scrubber, United Shear, Campbell cut-off.

Z2934 - FRACTIONATION & Deasterinizing vegetable, animal or marine fats and oils. Cap. 20,000 tons/year. Designed 12,000 gal./day useful for modifying fats & oils to yield high polyunsaturates of edible oils; cocoabutter substitutes, monoglyceride concentrates or high grade paint stock from fish or marine oils. Plant built 1949.

Z2846 - HEAVY MEDIA plant, Link-Belt, barrel type with pumps, screws, magnetic separator, etc. Including steel structure for building. Used 4 years as a coal cleaning plant. Capacity 2000 TPD. Now dismantled.

Z2918 - SARDINE CANNERY & Fish-Meal & Oil Plant, 10 ton/hr. Equipment includes dryers, presses.

Z2999 - SINTER Plant: 750 ton per day: Dwight-Lloyd 72" x 50' Sinter machine, McKee swing spout fluffer, pug mill, conveyors, feeders, vibrators, dust collectors and fans.

Z2939 - SOAP Manufacturing Plant: (3) story building approx. 54,000 sq.f Fatty acid splitting & Glycerine Plant with 260,000 gal. lead lin tanks. Stearic & Oleic acid plants, spray tower, filling and bagging; Sulphonation Plant. spray tower 90' x 30'; distillation equip. for fatty acids, packaging plant; Laundry Soap Plant: 100,000# laundry soap bars in 24 hours. Flake soap plant: 50,000# flakes in 24 hours. Laundry soap bulk 40,000#/24 hr. liquid or bulk.

Z2569 - SOLVENT EXTRACTION Plant, capacity 90 tons soybeans daily. Modern plant now producing high quality meal soya fleur.

Z3160 - TALL-OIL Refining Plant, 200/300 tons per month, with stainless steel kettles and piping, monel still, pumps, boiler, etc. Complete plant.

Z3067 - TOMATOE PUREE Facility, includes: graders, washers, scalders, conveyors, pulpers, elevators, cookers, boilers, fillers, can closer, boxers, etc.

Z2941 - TREATING & FRACTIONATING Plant for purification of motor grade Benzole to Nitration Grade products of Benzene, Toluene and Xylene; comprising a sulphuric acid treating unit and a fractional distillation unit. Refining accomplished by Polymerization and Extraction of the define with strong sulphuric acid and by fractional distillation. Treating plant has charge rate of 70,000 gal. per day.

Z3100 - HYDRATING Plant with Shaffer vertical hydrator. Capacity 5 ton/hr. with Peidometer. Raymond #1 mill with whizzer separator with vari-drive with motors. Still installed as operated.

Z2928 - FERTILIZER SUPERPHOSPHATE Acidulating Plant, capacity 25 tons/hr. Annual output of mixed fertilizer and superphosphate has been 60,000 tons per year. Main mixing plant 81,000 sq.ft.; cotton storage building 27,000 sq.ft.; complete repair shop and maintenance building; brick office building and other storage buildings. 15 acres of land with cyclone fence. Plant served by 2 railroads.

Z3273 - CHEESE Plants: with (3) 24FFF Damrow 14,000 lb. vat; (1) 24FF Damrow 10,000 lb. vat; 8 cpm can washer; 18,000 lb/hr. pasteurizer; 18,000 lb/hr. plate cooler; 5000 gal. Steriline tank; 42 x 120" double drum dryer; with agitators, presses and other items for cheese production. 125 HP Kewanee boiler.

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Z2758 - HEAVY MEDIA #2 Wemco MMS mobil mill consisting of: 7' cone separator with 5 HP motor, 3" Wemco sand pump, 3' x 16' Allis-Chalmers lowhead vibrating screen 5 HP, bucket elevator 1½ HP, 24" x 17' Wemco densifier 3 HP, demagnetizer magnetic separator, pumps, heavy media plant power center, structural steel framework for heavy media plant. Was used on coal at 35 TPH.

Z3181 - HYDROGEN Production Unit consists of two Drever Ammonia Dissociators and auxiliary equipment. Rated capacity 6000 cu.ft. per hour. Typical analysis of gas product is 25% nitrogen, 75% hydrogen and 0.05% ammonia.

Z2995 - INDUSTRIAL FINISHES Plant: 13,000 sq.ft. bldg. plus extra nitrocellulose storage plant and warehouse bldg. 2.6 acres of ground fenced in, equipment includes (2) 1400 gal. cotton cutters and mixers, GATX 700 gal. mixer, Cowles high speed mixer, Sheer-flow mixer, other assorted mixers, pebble mills, solvent tanks, filters, laboratory equipment, etc.

Z2799 - JELLY & PRESERVE Cookroom, all stainless steel contact parts. Main items: (3) jktd. vac. pans, (2) 150 gal. jktd. kettles, (5) 100 gallon jktd. kettle, (3) 50 gal. jktd. kettles, (7) 1/4 HP Lightnin mixers. With vacuum system, controls, pumps, piping, platforms, etc. Still installed.

Z2920 - MEAT PACKING Plant was killing 750 hogs per day, employed 350 men; 5½ acres ground, fence enclosed. Will sell with or without machinery remaining. Southern location.

Z2960 - OIL EXTRACTION Plant with: Andersen extraction columns, Solvent miscella work tank, distillation shacks, Anderson combination evaporators and stripper towers, Anderson oil filters, Link-Belt run-around for extraction columns etc. Each column has capacity of 90 tons combined in one plant with capacity of 180 tons. Will sell separately or together. Avail. at extra cost are toasters, meal driers, cracking mills & flaking mill.

Z2929 - OIL REFINERY, 25,000 bbl. per day capacity, complete.

Z2779 - OXYGEN Plant, portable, 5 tons of 99.5% liquid oxygen in 24 hours. Equivalent to 115,000 cu.ft. of gas. Consumes 22 gallons per hr. of fuel producing 2 lb. of oxygen per lb. of fuel. Trailer mounted with 600 HP Cummins V-12 Diesel power. Many spare parts. Plant is self contained & complete.

Z2938 - OXYGEN PLANT: Mfg. by Air Products, capacity 7.5 tons daily. Complete plant. Main air compressors completely refurbished.

Z2937 - OXYGEN PLANT: Mfg. Superior Air Products, type D Supairco Plant, capacity 1800 cu.ft. per hour of oxygen or alternately 9000 cu.ft. per hour of nitrogen. With (2) Norwalk TRS4T four stage air compressors, 50 HP. Considered like new condition.

Z3259 - PAPERBOARD MILL capacity 70-75 tons per day. Major items of equipment are: 48" x 92", 7 cylinder machine; 100 ton breaker beater, three 1500# finishing beaters, thickeners, classifier, three Globe rotary cookers. #2 and #6 Niemi Jordans. (68) dryers 36" x 86". Double cut-off sheeter; Longston winder. (4) stoker-fed boilers, 250 HP each.

Z3260 - PERMUTIT soft water plant: type AD, hot lime soda softener. Maximum capacity 30,000 gal. water per hour with (4) 90" dia. x 5' anthrafilt filters. Includes automatic controls, backwash pumps (655 gpm @ 40') meters, sedimentation tanks, etc.

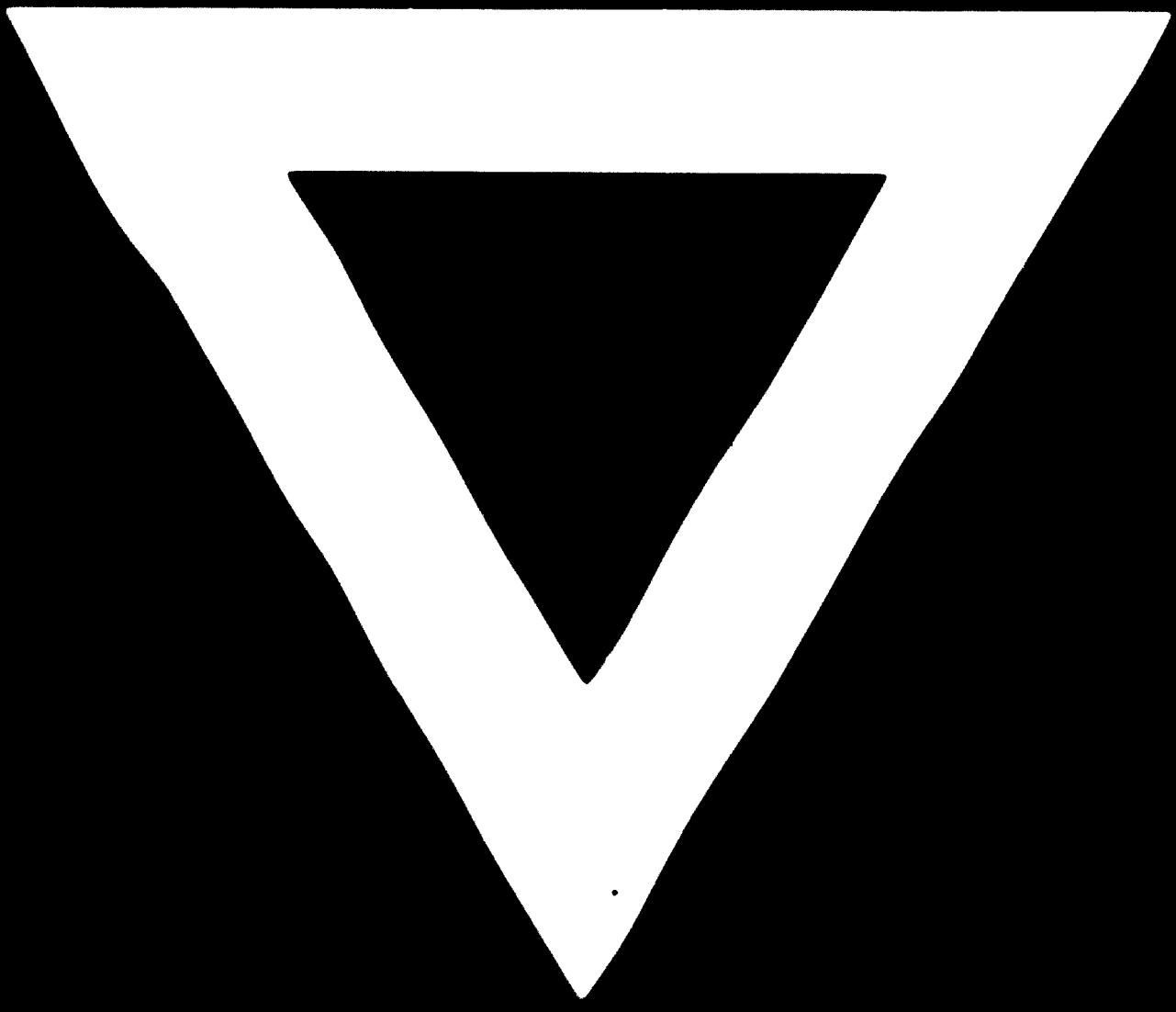
Z3025 - PHTHALIC ANHYDRIDE Plant. Fixed bed plant made up of a number of lines or "strings" which can be operated independently. Overall capacity approx. 25 million pounds of phthalic per year. Consists of 4 strings of low temperature converters lots design. Equip. can be broken down to give 1/2 or 1/4 of total capacity.

Z3001 - PIPE MILL butt weld: 1/4" to 4" nominal sizes skelp charger, furnace equipment, Aetna Std. draw bench, sizing rolls friction cut-offs, cross rolls and tables.

Z3068 - PREPARED MUSTARD Mfg. Plant: Includes 5 stone millm, 30 gal/hr. each; colloid mill, batch tank, finish tank 400 gal.; 8 oz. jar filler, capper.

Z2933 - RE-REFINE OIL Plant. Has been producing car journal oil to lubricate wheel bearings on railroad cars. Fuel oil selling to industrial plants. Road oil applied by their own men and trucks. Potential for expansion to produce excellent quality motor oil or residential fuel oil.

Z3368 - RUBBER HEEL Mfg. Plant: Includes (2) 48" x 16" x 11" Birmingham tap cap mills; 50" x 18 x 11" mill; 42" x 16" x 11" mill. (2) Banbury 3A mixers; 24" x 14 two roll mill; (6) Throop Hydraulic Presses 24" x 24" x 10", 3 ram 200 heel molds, many other items.



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